4. SAMPLING AND ANALYSIS TO VERIFY CONTAMINANT REMOVAL

4.1 Sampling and Analysis Protocol

The purpose of post-remediation sampling and analysis was to determine whether the post-remediation concentrations of COCs remaining in the soils meet the established RGs specified in the OU 9-04 ROD (DOE 1998). For the MFC site, RGs were calculated for both human and ecological receptors. The RGs for human health were calculated to prevent direct exposure to radionuclide COCs that would result in a total excess cancer risk of greater than 1 in 10,000 to a future resident 100 years from the time the analysis was made (2097). The 100-year scenario was selected for analyses as DOE control of INL lands was expected to last for at least 100 years. The RGs for the protection of the environment are to prevent exposure to COCs in soils, which may have potential adverse effects to resident flora and fauna, as determined by a hazard quotient that was set at 10 times the INL background soil concentrations. Achievement of the RGs ensures adequate present and future protection of human health and the environment. The initial 95% UCL concentration of COCs and the associated RGs for each site, as reported in the OU 9-04 ROD, are listed in Table 5.

Table 5. Estimated mean concentrations and final remediation goals for contaminants of concern at WAG 9 excavation sites.

Site	Receptor	Contaminant	95% UCL Concentration[a,b]	RG[b] Concentration[a,b]
Main Cooling Tower Blowdown Ditch (ANL-01A)	Ecological	Chromium III	709	500
Main Cooling Tower Blowdown Ditch (ANL-01A)	Ecological	Mercury	8.83	0.74
Interceptor Canal – Canal (ANL-09)	Human Health	Cesium-137	18	23.3
Interceptor Canal – Mound (ANL-09)	Human Health	Cesium-137	30.53	23.3
Industrial Waste Lift Station Discharge Ditch (ANL-35)	Ecological	Silver	352	112
Industrial Waste Pond (ANL-01)	Human Health	Cesium-137	29.2	23.3
Industrial Waste Pond (ANL-01)	Ecological	Chromium III	1,030	500
Industrial Waste Pond (ANL-01)	Ecological	Selenium	8.41	3.4
Industrial Waste Pond (ANL-01)	Ecological	Zinc	5,012	2,200
Industrial Waste Pond (ANL-01)	Ecological	Mercury	2.62	0.74
Main Cooling Tower Blowdown Ditch (ANL-01A)	Ecological	Mercury	3.94	0.74
Main Cooling Tower Blowdown Ditch (ANL-01A)	Ecological	Chromium III	1,306	500

Table 5. (continued).

Site	Receptor	Contaminant	95% UCL Concentration[a,b]	RG[b] Concentration[a,b]
Interceptor Canal – Canal (ANL-09)	Ecological	Zinc	3,020	2,200

a. Concentrations in mg/kg or pCi/g, determined during site characterization activities prior to remediation activities.
b. DOE 1998.

4.2 Sampling Activities

Post-remedial action confirmation sampling occurred during two separate sampling events governed by two separate sampling and analysis plans (SAPs). Post-phytoremediation sampling of the west portion of the MCTBD and the ICM was conducted in 2003 (Portage 2003). Post-excavation sampling of the IWP, the IWLSDD, and Ditch A were conducted in 2004 (Portage 2004). Each SAP provides a complete description of the sites that were sampled, project organization, and quality assurance (QA) and quality control (QC) procedures that were used to sample the in-situ soils following remedial action activities. The QA/QC approach outlined in both SAPs followed the QA/QC approach in the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004). The following subsections provide a summary of the location and type of samples collected in support of remedial action completion. For additional details refer to the SAP associated with these activities.

4.2.1 Main Cooling Tower Blowdown Ditch (ANL-01A)

4.2.1.1 East Portion. Confirmation samples were not collected in 2000 following soil removal activities for the east portion of the MCTBD. The soil was removed to the underlying basalt layer, precluding the collection of confirmation samples in these areas.

4.2.1.2 West Portion. Final confirmation samples were collected in 2003 from post-remediation soils at the west portion of the MCTBD. Soils were analyzed for chromium III and mercury, as defined in the associated SAP (*Sampling and Analysis Plan for the Post-Phytoremediation Characterization of ANL-W CERCLA Sites* [Portage 2003]). The post-remediation sample set from the west portion of the MCTBD consisted of 16 surface soil samples (0–6 in.), 16 subsurface soil samples (6–24 in.), and two rinsate samples. The two rinsate samples were collected from equipment used in obtaining soil samples and analyzed to determine if equipment may have contributed to concentrations of chromium III and/or mercury detected in the soil samples. Sampling locations are shown in Figure 20. At each sampling location, one surface sample was collected for analyses, as well as one subsurface sample that was composited from a depth of 6–24 in.

4.2.2 Interceptor Canal – Mound (ANL-09)

Final confirmation samples were collected in 2003 from post-remediation soils at the ICM. Soils were analyzed for cesium-137 as defined in the associated SAP (Portage 2003). The post-remediation sample set from the west portion of the MCTBD consisted of 16 surface soil samples (0–6 in.), 16 subsurface soil samples (6–24 in.), and two rinsate samples. The two rinsate samples were collected from equipment used in obtaining soil samples and analyzed to determine if equipment may have contributed to concentrations of cesium-137 detected in the soil samples. Sampling locations are shown in Figure 21. At each sampling location, one surface sample was collected for analyses, as well as one subsurface sample that was composited from a depth of 6–24 in.

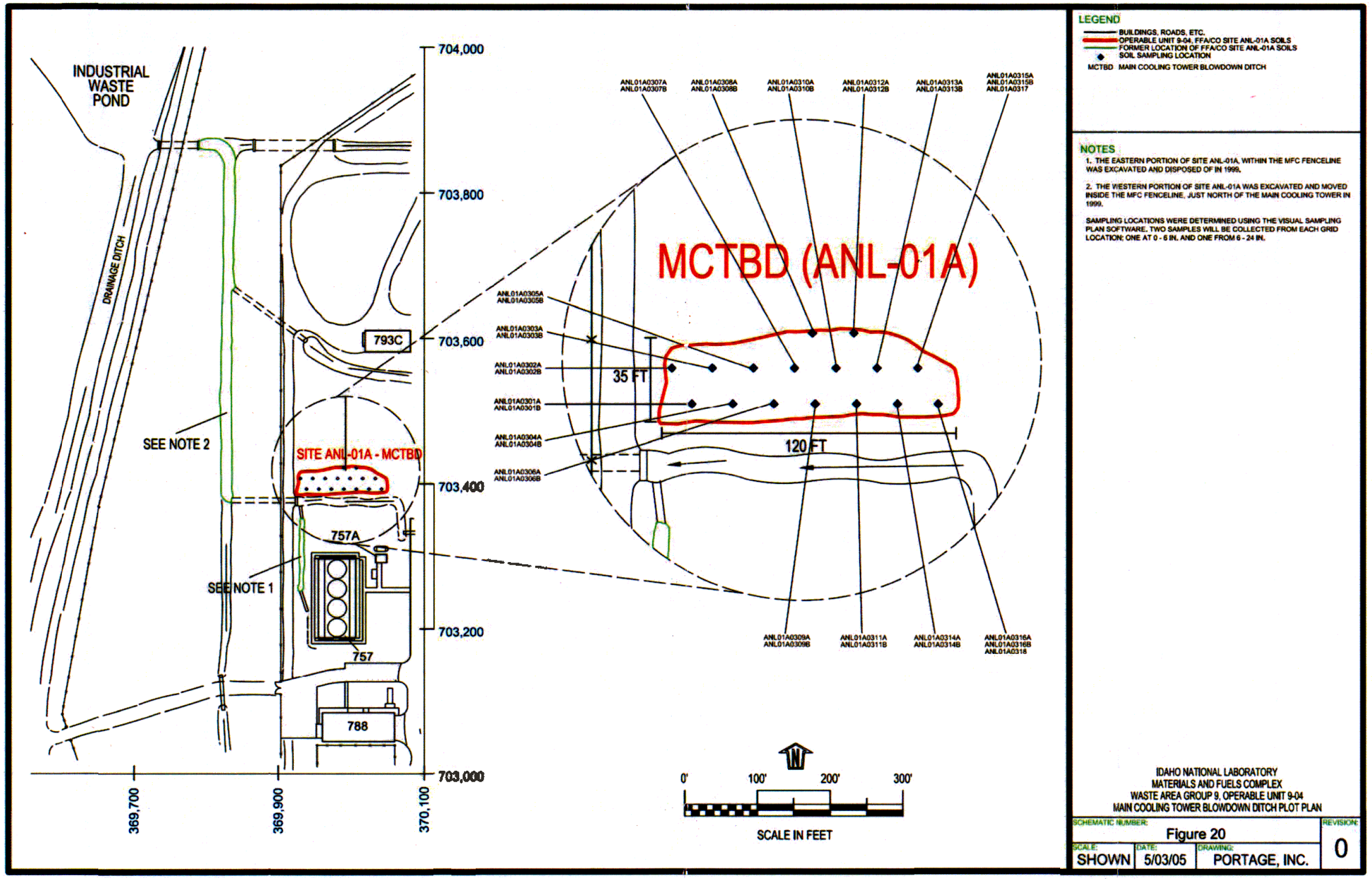
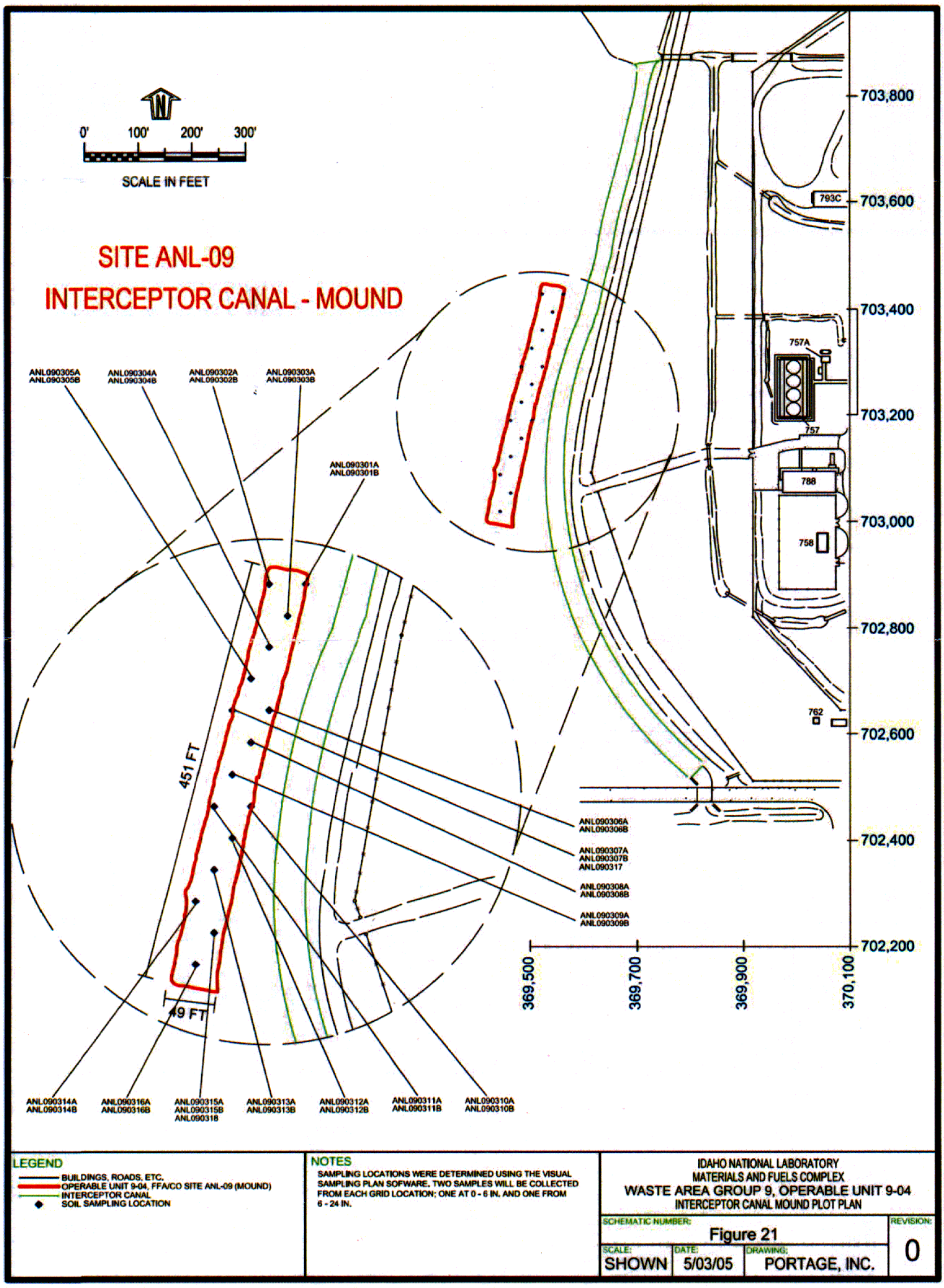


Figure 20. Main Cooling Tower Blowdown Ditch (t portion) plot plan showing 2003 sampling locations.

Figure 21. Interceptor Canal – Mound plot plan showing 2003 sampling locations.



4.2.3 Industrial Waste Lift Station and Discharge Ditch (ANL-35)

Confirmation samples were first collected from the IWLSDD in 2003 following 4 years of phytoremediation (Portage 2003). Results indicated that additional remediation (i.e., excavation and disposal) was necessary (Portage 2005a). Confirmation samples were collected again in 2004 following the excavation and disposal of contaminated soils (Portage 2004). Soils from both sampling events were analyzed for silver. The 2004 post-remediation sample set from the IWLSDD consisted of 16 surface soil samples (0–6 in.), 12 subsurface soil samples (6–24 in.), and two rinsate samples. The two rinsate samples were collected from equipment used in obtaining soil samples and analyzed to determine if equipment may have contributed to concentrations of silver detected in the soil samples. Sampling locations are shown in Figure 22. At each sampling location, one surface sample was collected for analyses, as well as one subsurface sample that was composited from a depth of 6–24 in. Note that 12 subsurface samples rather than 16 were collected due to the inability to obtain samples from some of the subsurface sampling locations. Although a surface and subsurface sample at each location were indicated in the SAP (Portage 2004), it was determined that this deviation was not significant enough to cause a rejection of the data.

4.2.4 Industrial Waste Pond (ANL-01)

Confirmation samples were collected in 2004 from post-remediation soils at the IWP. Soils were analyzed for cesium-137, chromium, mercury, selenium, and zinc, as defined in the associated SAP (Portage 2004). The post-remediation sample set from the IWP consisted of 16 surface soil samples (0–6 in.), 15 subsurface soil samples (6–24 in.), and two rinsate samples. The two rinsate samples were collected from equipment used in obtaining soil samples and analyzed to determine if equipment may have contributed to concentrations of the COCs detected in the soil samples. Sampling locations are shown in Figure 23. At each sampling location, one surface sample was collected for analyses, as well as one subsurface sample, which was composited from a depth of 6–24 in. Note that 15 subsurface samples rather than 16 were collected due to the inability to obtain samples from some of the subsurface sampling locations. Although a surface and subsurface sample at each location were indicated in the SAP (Portage 2004), it was determined that this deviation was not significant enough to cause a rejection of the data.

4.2.5 Ditch A (ANL-01)

Confirmation samples were first collected from Ditch A in 2003 following 4 years of phytoremediation (Portage 2003). Results indicated that additional remediation (i.e., excavation and disposal) was necessary (Portage 2005a). Confirmation samples were collected again in 2004 following the excavation and disposal of contaminated soils (Portage 2004). Soils from both sampling events were analyzed for mercury. The 2004 post-remediation sample set from Ditch A consisted of 16 surface soil samples (0–6 in.), 16 subsurface soil samples (6–24 in.), and two rinsate samples. The two rinsate samples were collected from equipment used in obtaining soil samples and analyzed to determine if equipment may have contributed to concentrations of mercury detected in the soil samples. Sampling locations are shown in Figure 24. At each sampling location, one surface sample was collected for analyses, as well as one subsurface sample that was composited from a depth of 6–24 in.

4.2.6 Ditch B (ANL-01)

Confirmation samples were not collected in 2000 following soil removal activities for Ditch B. The soil was removed to the underlying basalt layer, precluding the collection of confirmation samples in these areas.

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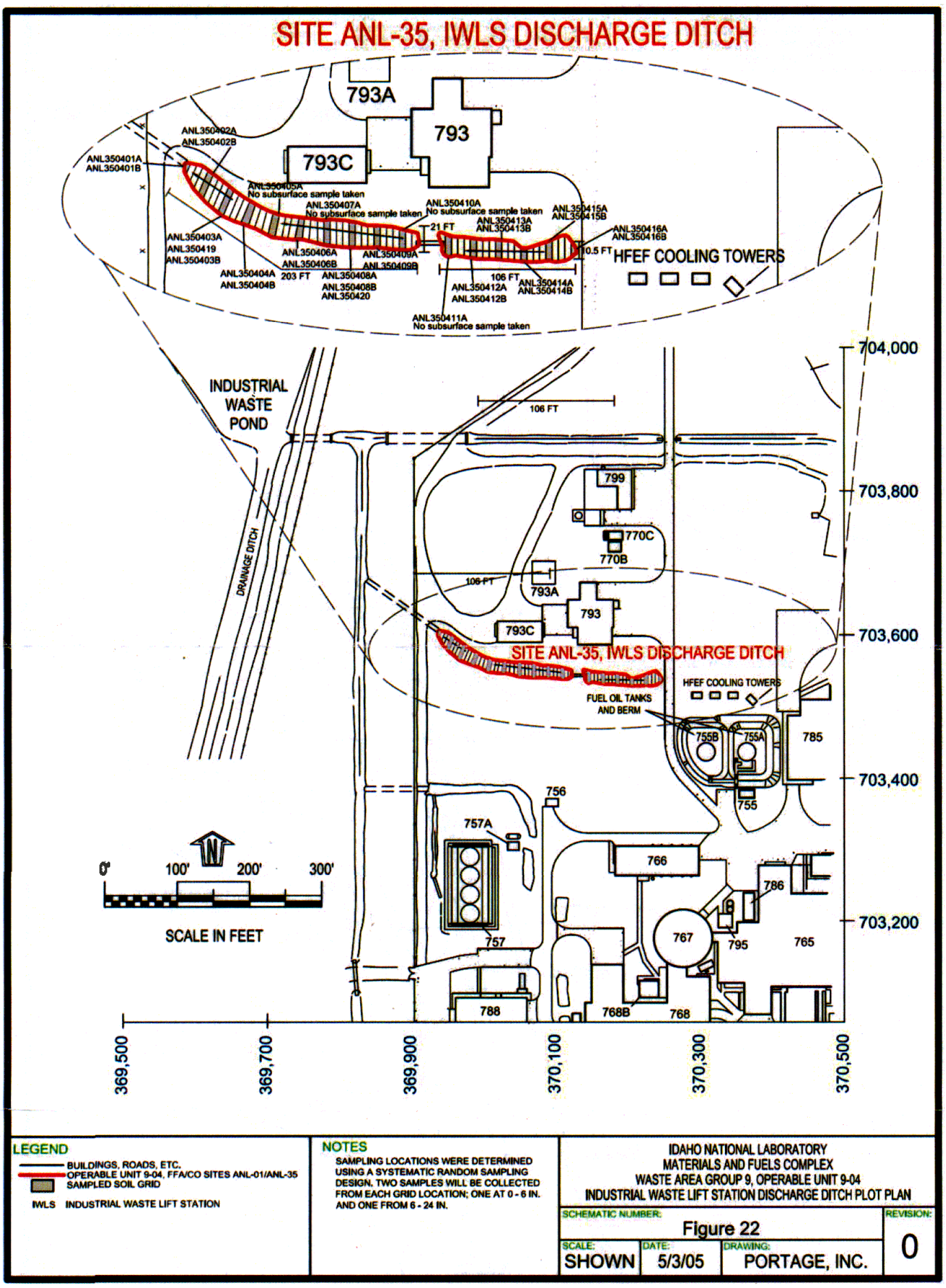
Figure 22. Industrial Waste Lift Station Discharge Ditch plot plan showing 2004 sampling locations.



LEGEND

- BUILDINGS, ROADS, ETC.
- OPERABLE UNIT 9-04, FFA/CO SITES ANL-01/ANL-35
- SAMPLED SOIL GRID
- IWLS INDUSTRIAL WASTE LIFT STATION

NOTES

SAMPLING LOCATIONS WERE DETERMINED USING A SYSTEMATIC RANDOM SAMPLING DESIGN. TWO SAMPLES WILL BE COLLECTED FROM EACH GRID LOCATION; ONE AT 0 - 6 IN. AND ONE FROM 6 - 24 IN.

IDAHO NATIONAL LABORATORY
MATERIALS AND FUELS COMPLEX
WASTE AREA GROUP 9, OPERABLE UNIT 9-04
INDUSTRIAL WASTE LIFT STATION DISCHARGE DITCH PLOT PLAN

SCHEMATIC NUMBER:			REVISION:
Figure 22			0
SCALE: SHOWN	DATE: 5/3/05	DRAWING: PORTAGE, INC.	

Figure 23. Industrial Waste Pond plot plan showing 2004 sampling locations.

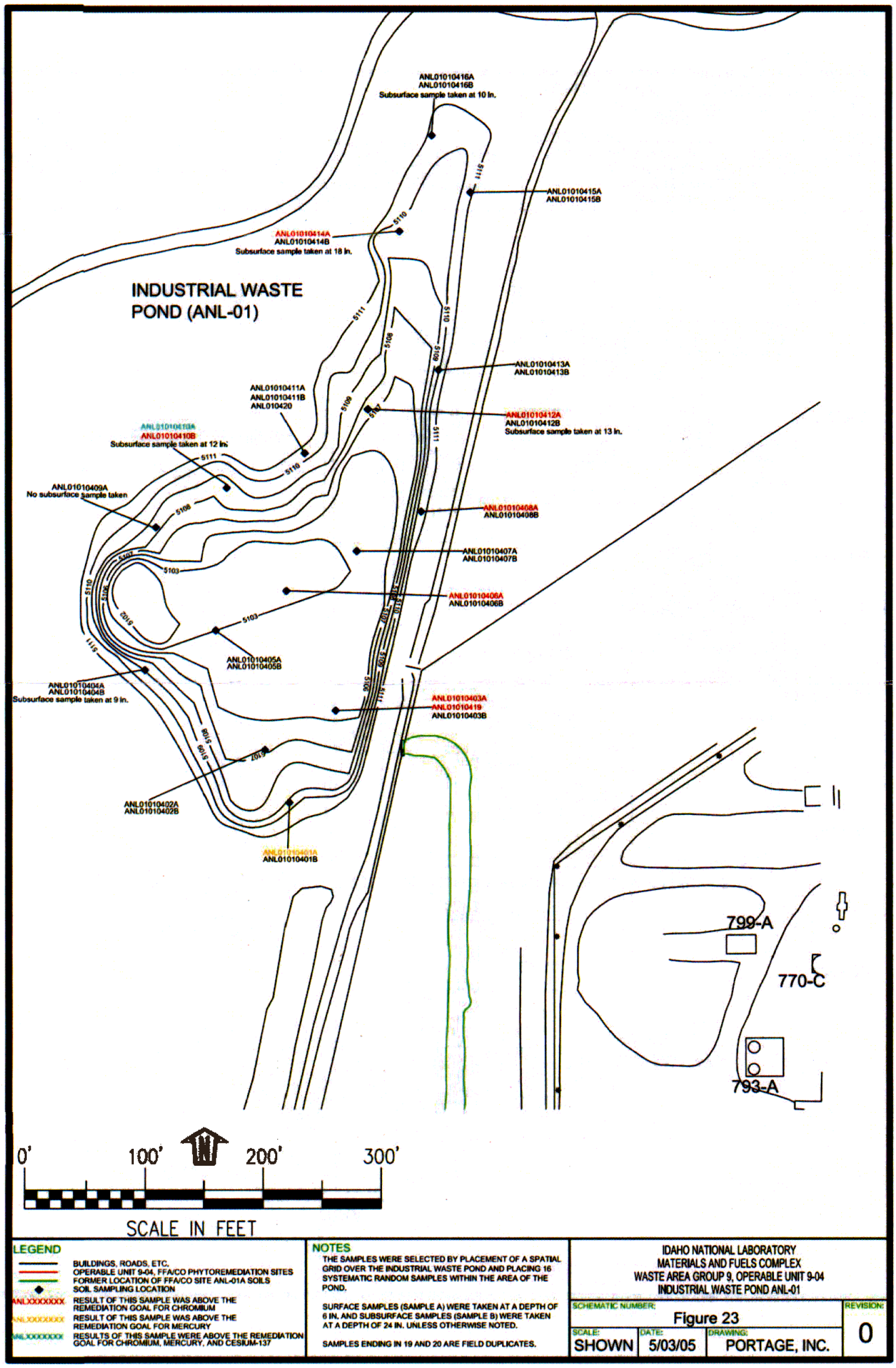
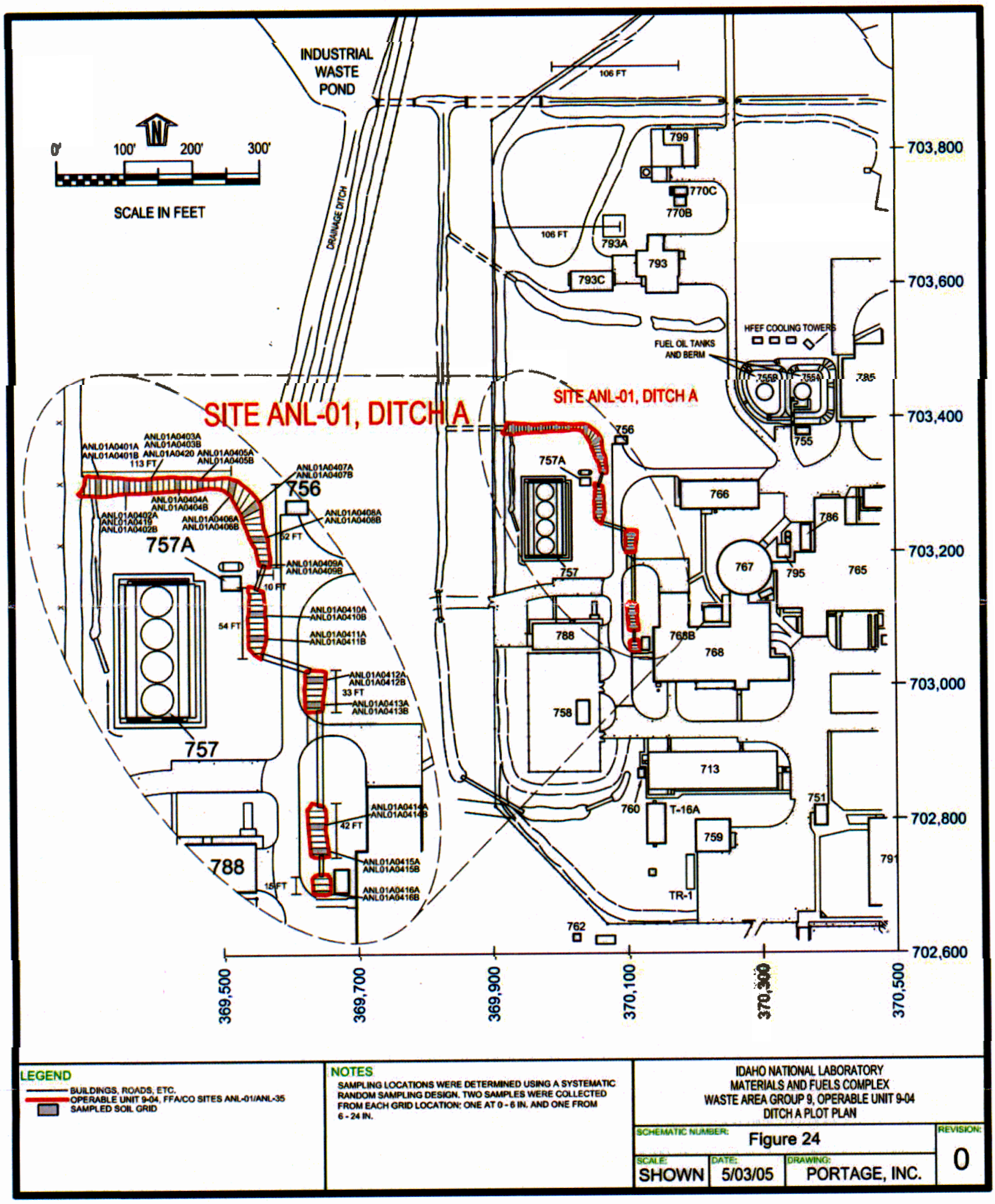


Figure 24. Ditch A plot plan showing 2004 sampling locations.



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5. DISCUSSION OF ANALYTICAL RESULTS

A data quality assessment (DQA) was completed for confirmation samples collected in 2003 (post-phytoremediation) and for those collected in 2004 (following soil removal activities). The post-phytoremediation sampling effort in 2003 included the west portion of the MCTBD, the ICM, the IWLSDD, and Ditch A; however, results were indicative of successful completion of remediation for the west portion of the MCTBD and the ICM only (Portage 2005a). Based on the results, focused soil removal activities were conducted in the IWLSDD and Ditch A, followed by the collection of new confirmation samples in 2004 (Portage 2005b). Confirmation samples for the IWP were also collected in 2004.

The data analyzed in these two reports were generated from the confirmation sample results of the soils remaining at each site after completion of remediation activities. The soils data were assessed to determine whether the concentrations of COCs were reduced below the RGs established in the OU 9-04 ROD. A summary of the surface soil results (0–6 in.) is provided in Table 6. A summary of the subsurface soil results (6–24 in.) is provided in Table 7.

The following subsections provide a summary of the final analysis results pertaining to the samples collected from post-remediation soils at the MFC. For additional details refer to the DQA associated with these activities.

5.1 Main Cooling Tower Blowdown Ditch

5.1.1 East Portion

Confirmation samples were not collected in 2000 following soil removal activities for the east portion of the MCTBD. The soil was removed to the underlying basalt layer, precluding the collection of confirmation samples in these areas.

5.1.2 West Portion

The UCLs computed from both the surface and subsurface samples collected in 2003 from the west portion of the MCTBD indicate that levels of chromium are well below the RG. The mercury levels in soils from the west portion of the MCTBD were also below the RG; however, two of the observed subsurface values were notably greater than the RG and two of the observed values from the surface samples were very close to the RG. The location of these samples was randomly distributed within the ditch (Portage 2005a), suggesting that no localized "hot spot" existed requiring additional removal activities. Remedial efforts for soils from the west portion of the MCTBD were successful.

Table 6. Summary of post-remediation concentrations of hazardous and radioactive contaminants of concern in surface soils.

Site	Analyte	95% UCL (mg/kg or pCi/g)	RG (mg/kg or pCi/g)	RG Exceeded?
MCTBD – East Portion (ANL-01A)[a]	Cr		500	No
MCTBD – East Portion (ANL-01A)[a]	Hg		0.74	No
MCTBD – West Portion (ANL-01A)[b]	Cr	54.8	500	No
MCTBD – West Portion (ANL-01A)[b]	Hg	0.42	0.74	No
ICC (ANL-09)[a]	^{137}Cs	18	23.32	No
ICM (ANL-09)[b]	^{137}Cs	9.54	23.30	No
IWLSDD (ANL-35)[c,d]	Ag	69.2	112	No
IWP (ANL-01)[c,e]	Cr	626	500	Yes[f]
IWP (ANL-01)[c,e]	Hg	0.35	0.74	No
IWP (ANL-01)[c,e]	Zn	374	2200	No
IWP (ANL-01)[c,e,g]	^{137}Cs	10.0	23.3	No
Ditch A (ANL-01)[c]	Hg	0.64	0.74	No
Ditch B (ANL-01)[a]	Cr		500	No
Ditch B (ANL-01)[a]	Zn		2200	No

a. DOE 1999.

b. Portage 2005a.

c. Portage 2005b.

d. Results are presented without identified "hot spots." Additional focused soil removal actions were taken in this area following receipt of analytical results.

e. Results are presented without Sample ID ANL010410. Additional soil removal actions were taken in this area in November 2004, following receipt of analytical results, to remove the identified "hot spot." Soils were removed to the underlying basalt layer, precluding the collecting of confirmation samples.

f. Although confirmation samples collected in 2004 indicated that the 95% UCL for chromium was greater than the RG, it was determined that further remediation of the IWP was not warranted. For details of this decision see Subsection 5.4.

g. Cohen's adjustment was used to compute the mean and standard deviation used to calculate the 95% UCL.

Table 7. Summary of post-remediation concentrations of hazardous and radioactive contaminants of concern in subsurface soils.

Site	Analyte	95% UCL (mg/kg or pCi/g)	RG (mg/kg or pCi/g)	RG Exceeded?
MCTBD – East Portion (ANL-01A)[a]	Cr		500	No
MCTBD – East Portion (ANL-01A)[a]	Hg		0.74	No
MCTBD – West Portion (ANL-01A)[b]	Cr	61.0	500	No
MCTBD – West Portion (ANL-01A)[b]	Hg	0.37	0.74	No
ICC (ANL-09)[a]	^{137}Cs	18	23.3	No
ICM (ANL-09)[b]	^{137}Cs	2.48	23.3	No
IWLSDD (ANL-35)[c]	Ag	32.3	112	No
IWP (ANL-01)[c,d]	Cr	181	500	No
IWP (ANL-01)[c,d]	Hg	0.073	0.74	No
IWP (ANL-01)[c,d]	Zn	145	2,200	No
IWP (ANL-01)[c,d,e,f]	^{137}Cs (ln[x] transformation)	0.208	3.15	No
Ditch A (ANL-01)[c,e,f]	Hg (ln[x] transformation)	-2.6	-0.30	No
Ditch B (ANL-01)[a]	Cr		500	No
Ditch B (ANL-01)[a]	Zn		2200	No

a. DOE 1999.

b. Portage 2005a.

c. Portage 2005b.

d. Results are presented without Sample ID ANL010410. Additional soil removal actions were taken in this area, following receipt of analytical results, to remove the identified "hot spots."

e. Cohen's adjustment was used to compute the mean and standard deviation used to calculate the 95% UCL.

f. Remediation goal shown after the ln[x] transformation.

5.2 Interceptor Canal Mound

Results observed from the ICM data obtained from 2003 confirmation sampling activities indicated that neither the UCLs calculated from the surface data nor the UCLs for the subsurface data exceed the RG for cesium-137. All of the observed values were also well below the RG. Therefore, phytoremediation efforts for ICM soils were successful (Portage 2005a).

5.3 Industrial Waste Lift Station and Discharge Ditch

The UCLs computed from both the surface and subsurface samples data from 2004 confirmation sampling activities did not exceed the RG for silver. However, the surface soil data contained three values that were considerably larger than the RG, while the subsurface data did not contain any values in excess of the RG. Thus, even though the calculated UCLs were less than the RG, "hot spots" were identified in one location in the west portion of the ditch and in the west half of the east ditch. Based on these results, focused removal of soils was conducted in 2004 as a best management practice. As the overlying contaminated soils were removed to the level of the underlying basalt layer, additional soil samples could not be collected. Confirmation sampling data collected in 2004 (Portage 2005b) coupled with complete soil removal of the identified "hot spots" demonstrate that remediation efforts for the IWLSDD were successful.

5.4 Industrial Waste Pond

The IWP was analyzed in 2004 for chromium, mercury, selenium, zinc, and cesium-137 (Portage 2005b). Only the surface chromium UCL exceeded the RG; several observed values of chromium in the surface soils were considerably greater than the RG. The surface soils also contained two mercury values and one cesium-137 value that exceeded the RGs. Geographical distribution of the elevated chromium concentrations indicated that chromium contamination was not limited to a specific area of the pond; however, one sampling location produced the highest observed measurements of all three analytes as well as the only subsurface sample that exceeded an RG. Therefore, it was determined that additional remediation efforts were warranted in the northwest corner of the IWP. Additional soils were excavated from this area in 2004. As the overlying contaminated soils were removed to the level of the underlying basalt layer, additional soil samples could not be collected (Portage 2005b).

However, even with the removal of the data associated with the soils excavated from the northwest corner of the IWP, the 95% UCL for chromium still exceeds the RG for surface soils. The ecological functional group for which trivalent chromium may pose an unacceptable risk is vegetation. In the RI/FS, the vegetation functional group was represented by sagebrush, which is deep rooted, and bunchgrass, which is shallow rooted. At the time the ROD was signed, it was assumed that the pond would cease receiving wastewater from operations and would be revegetated consistent with a desert steppe habitat. Therefore, both sagebrush and bunchgrass might be expected to reestablish in the former pond area. However, revised future plans call for MFC to continue to use the IWP for discharge of noncontaminated wastewaters. Since the IWP will continue to be flooded by the discharges, it is unlikely that either sagebrush or bunchgrass will reestablish over large portions of the pond in the foreseeable future.

As the IWP will be used in the future to transport noncontaminated wastewater, it was determined that although the 95% UCL for chromium exceeds the RG for surface soils, the vegetative ecological risk receptors of bunchgrass and sagebrush are unlikely to reestablish in the IWP. Therefore, it was

determined through a consensus agreement of the OU 9-04 WAG managers that further remediation of the IWP is not warranted.[d]

5.5 Ditch A

Neither the surface UCL nor the subsurface UCL obtained from the Ditch A samples collected in 2004 exceeded the RG for mercury. However, two of the observed values from the surface soils were greater than the RG. Concentrations observed at each sampling point were examined to determine if elevated mercury concentrations were limited to one or two areas of the ditch. No specific pattern was identified, and as the UCLs for mercury are below the RG, it was determined that the remedial efforts for Ditch A were successful (Portage 2005b).

5.6 Ditch B

Confirmation samples were not collected in 2000 following soil removal activities for Ditch B. The soil was removed to the underlying basalt layer, precluding the collection of confirmation samples in these areas.

d. DEQ correspondence to M. Holzmer, December 6, 2004, "Re: Operable Unit 9-04 Remedial Action."

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6. PROJECT COMPLETION

6.1 Resolution of Outstanding Items from Pre-Final Inspection

The pre-final inspection was conducted in September 2004 by Matt Wilkening of EPA, Region 10, and Ted Livieratos of DEQ. Excavation activities at the IWP were not complete at the time of the pre-final inspection. Supplemental photos taken after completion of remedial activities at the IWP and confirmation sampling results have been submitted to the Agencies. Confirmation sampling activities conducted in 2003/2004 were performed by an independent contractor (Portage, Inc.). These photographs and sample results served as a basis for the pre-final inspection as the sites were covered with snow at the time.

The final inspection was conducted on March 8, 2005, by Ted Livieratos of DEQ. The final inspection consisted of a preliminary examination of the revegetated practices that were conducted on the IWP and the ICM. As the plants had not yet germinated, additional surveillance of the revegetated areas will be conducted in September 2005. At this time, supplemental revegetation activities will be initiated, as needed, to ensure the success of the revegetation effort. The remaining ditches were either excavated to the underlying basalt layer (east portion of the MCTBD and Ditch B) or will continue to transport surface water runoff (west portion of the MCTBD, IWLSDD, and Ditch A); therefore, revegetation was not completed in these ditches.

6.2 Cost Assessment

The costs associated with the remediation effort at OU 9-04 are provided in Table 8. Costs are divided into three remedial action phases based upon the type and timing of remedial action that was completed: (1) the first excavation and disposal effort, which included the east portion of the MCTBD and Ditch B; (2) the phytoremediation effort, which included the west portion of the MCTBD, the IWLSDD, the ICM, and Ditch A; and (3) the second excavation and disposal effort, which included the IWLSDD, the IWP, and Ditch A.

Table 8. Summary of costs associated with remedial activities for OU 9-04.

	Estimated Cost[a]	Actual Cost to Date[b]
First Excavation and Disposal Effort (2000)		
East portion of the MCTBD	$260,000	$245,000
Ditch B		
Phytoremediation Effort (1999–2003)[c]		
West portion of the MCTBD	$2,534,083	$1,985,000
IWLSDD		
ICM		
Ditch A		
Second Excavation and Disposal Effort (2004)		
IWLSDD	$1,834,393	$1,680,000
IWP		
Ditch A		
Total cost of remedial activities	$4,628,476	$3,910,000

a. DOE 1998.

b. Actual costs do not include costs for pulling the bypass system from the ditch, removal of piping, installation of new culverts, installation of security upgrades that were disturbed during rerouting ditch effluent, and regrading of the ditches discharging to the IWP. Costs for these activities are estimated at $145,000.

c. Estimated cost represents 7 years of phytoremediation. Actual time to completion was 4 years.

The volumes, and therefore, the costs associated with both the phytoremediation and excavation effort at the MFC were significantly lower than the estimates provided in the OU 9-04 ROD. The ROD estimated a total volume of approximately 3,170 yd^3 of contaminated soil for the seven OU 9-04 sites addressed in this Remedial Action Report. However, the contingent remedy of excavation and disposal was implemented for only five of the seven sites with 1,736 yd^3 of contaminated soils disposed. The volume of waste generated during the phytoremediation effort was also significantly less than that estimated in the ROD. For the two sites that were remediated by phytoremediation exclusively (the west portion of the MCTBD and the ICM), the contaminant uptake rate was greater than that estimated in the bench-scale study; therefore, only 4 of the 7 years estimated in the ROD were required to reach the RGs. The remaining sites that required excavation to meet their respective RGs also did not complete the full 7 years of phytoremediation.

A significant reduction in cost was also realized during the excavation efforts at the MFC by the use of a subcontractor that was already in place at INL. Bechtel BWXT Idaho, LLC, the INL contractor, was able to amend the scope of work for their contract with Stoller, the ICDF subcontractor, to allow the acceptance of soils excavated from the MFC OU 9-04 sites for disposal at the ICDF. This enabled both Bechtel BWXT Idaho, LLC and MFC to take advantage of existing procedures and agreements to complete the cleanup of the OU 9-04 sites. Disposal of the excavated soils at the ICDF reduced costs and efficiently utilized equipment and personnel already in place at INL.

6.3 Observations and Lessons Learned

Phytoremediation was a new and innovative technology at the time the OU 9-04 ROD was signed. Most of the equipment necessary for the successful completion of the phytoremediation effort was not commercially available; therefore, existing, commercially available equipment was modified to meet the needs of the MFC. The automatic watering system used in the MFC phytoremediation effort included a

monitoring device that could detect the water content of the soil 1 ft bgs. This device helped to reduce the likelihood of leaching contaminants from the soil. The automatic watering system also included a weather station, which was used to determine when it was raining, and therefore, the irrigation system was not needed. At the completion of the phytoremediation effort, this equipment was sold to other phytoremediation sites as a commercial product.

Commercially available farm equipment was also modified to facilitate harvesting activities. A potato lift was modified to extend the shovels in front of the lift and to drop the depth of excavation to 18 in. These modifications allowed for collection of the kochia root and plant intact. A hay rake was used in an unconventional way by attaching it to a taller tractor to allow the passage of the tractor without damage to the windrows of plant matter. The baler used in the phytoremediation effort was also modified to make smaller bales by adding an extension onto the throw arm.

6.4 Health and Safety

Remedial activities were performed following the completion of a job safety analysis (JSA) that identified possible health and safety issues that could arise during the completion of remedial activities at the MFC. As a result of the JSA, several measures were taken to ensure the completion of remedial activities in a safe and productive manner. Exclusion areas, step-off areas, and contaminant reduction areas were established to reduce the spread of radioactive contaminants. A radiological work permit and full-time Health Physics support were required for areas contaminated with cesium-137 (the ICM and IWP). Personal dosimetry was also required for workers entering radiologically controlled areas; no exposures were reported for personnel or equipment associated with remedial activities. Access control was maintained at the MFC gatehouse and to the road leading to the ponds to prevent inadvertent human exposure. Dust and soils were selectively monitored to determine worker exposure, and dust suppression measures were taken to reduce exposure levels. All work was performed in Level D PPE.

6.5 Certification that Remedy is Operational and Functional

The implemented remedies for remediation of the OU 9-04 sites at the MFC have been certified as operational and functional as documented in this Remedial Action Report.

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7. CONTACT INFORMATION

The following contractors were used:

For the MFC remedial action report, sampling plans, and DQAs:

Portage, Inc.
1075 S. Utah Ave.
Idaho Falls, ID 83402
(208) 528-6608

For EPA oversight:

Not Applicable

The following companies analyzed samples:

For the MFC:

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045
(314) 298-8566

For the EPA:

Not Applicable

The project manager was:

For the MFC:

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Idaho National Laboratory
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Mail Stop 6164
Idaho Falls, ID 83415
(208) 533-7829

For the EPA:

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For the DEQ:

State of Idaho Department of Environmental Quality
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Boise, ID 83706-1255

For the DOE:

Greg Bass

DOE Team Leader
Materials and Fuels Complex
P.O. Box 2528
Idaho Falls, ID 83403-2528

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8. REFERENCES

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Attachment A

Pre-Final Inspection Checklist

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Attachment A

Pre-Final Inspection Checklist

The pre-final inspection for the OU 9-04 remedial action was performed in September 2004. The inspection was performed by Matt Wilkening of EPA, Region 10, and Ted Livieratos of DEQ. The inspection consisted of observation of the following activities:

- Excavation and disposal of contaminated soils which was completed by the INL ICDF contractor, Stohler
- Integrated Waste Tracking System entries of the documentation of the soil volumes of soils disposed in the ICDF or INL Industrial Waste Landfill at CFA
- The verifications that soils disposed in ICDF met the ICDF WAC
- Additional photos were requested to document the remedial activities.

Items that were not completed at that time were the "hot spot removal," which was completed in October 2004, and the revegetation, which was completed in November 2004.

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Attachment B

Response to Agency Comments

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Portage ENVIRONMENTAL

Review Comments and Resolutions

Tracking No.: _____ (Optional)

Technical Point of Contact: Brady Orchard, P. E.	Phone No.: 208-227-1381	Return Comments To:	E-Mail:	Comments Due By:	Reviewer's Name/Discipline: DEQ Comments	Phone No.:

Comments resolved by:	Date:	Signature of reviewer accepting resolution of significant comments:	Date:
C. B. Potelunas/H. Guerrero (Portage)	05/03/2005		

* Comments so marked are considered to be significant and must be resolved to the reviewer's satisfaction. *Significant comment.* A reviewer's written response that is derived from the reviewer's area of expertise or discipline or that addresses material assigning tasks to the reviewer's organization. Significant comments address issues of: A. noncompliance with laws, regulations, permits, standards, B. proper conduct of mission-critical operations, C. creating unsafe conditions that could result in personal injury, death, damage to the environment, D. creating conditions that could result in significant nonessential costs to the company.

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1	PP 1, Sect 1, para 2, 1st sent.		This issue is currently being resolved. Therefore, the referenced date should be 2005, instead of 2004. Please correct.	An updated discussion on transfer of the SSL to OU 10-08 has been added to Section 1.	
2	PP 1, Sect 1, para 3, last sent.		This sentence and paragraph should be reworded to better reflect the timeframes in which decisions were made. Although in 2002, it may have been determined that the IWP no longer had a use, it is our understanding that the current Materials and Fuel Comlex (MFC) mission includes continued use of the IWP.	The paragraph has been rewritten to better reflect the decision making timeframes and to better reflect the future use of the IWP.	
3	PP 24 thru 25, Sect 3.1.4		These sections should include more information regarding the amount of phytoremediation wastes that were harvested and disposed. It would be helpful to include the disposal records in an appendix. Additonally, please discuss in the text the criteria that determined the disposal locations.	A discussion of the information concerning the quantities of phytoremediation wastes harvested and disposed of has been added.	
4	PP 26 thru 30, Sect 3.2		Please include information showing the amount of waste disposed from each site, the disposal location(s), and the criteria used for determining the disposal locations.	Additional detail regarding waste disposal has been added (as Table 2)	
05	PP 28, Sect 3.2.2, last para		Please indicate the methods used to analyze the decontamination fluids, the analytical results, and whether they were analyzed for radionuclides in addition to hazardous constituents. Additionally, please state where these wastes were ultimately disposed; it is unclear what is meant by the statement that the wastes were disposed "in accordance with applicable ANL-W waste handling procedures."	A discussion of the analyses of the decontamination fluids and the ultimate disposal location of these fluids has been added.	
6	PP. 29, Sect 3.2.5, Para 2, 1st Sen.		It would be better to state that the "seeding" of the IWP and IC-M was completed in November, 2004 (please correct the year). Since the seeds are probably just starting to germinate, it is premature to state that re-vegetation is complete.	Typographical error in date has been corrected. Wording changed to reflect site was seeded in November 2004.	
7	PP. 29, Sect. 3.2.5, Para. 2		Please discuss the operations and maintenance activities that will ensure that these areas have re-vegetated effectively.	Although revegetation of these areas is not considered part of the remedy, a discussion has been added concerning continued inspections and maintenance activities that will	

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				be performed to ensure the sites have been effectively revegetated.	
8	PP. 42-43, Sect. 5, Tables 3 & 4 Footnote d, & PP. 44, Sect. 5.4 Para. 2		Footnote (d) in both tables and Section 5.4 describe combining shallow and subsurface results for chromium in the IWP samples. However, these citations attempt to link the decision to pool the data to the rationale presented in the December 6, 2004 letter from the DEQ to ANL-W regarding the OU 9-04 Remedial Action. In particular, the December 6, 2004 letter outlined the reasons we believe ANL-W has adequately addressed unacceptable risks at the IWP. The rationale for our recommendation did not involve combining the surface and subsurface data in order to meet the 95 percent Upper Confidence Limit (UCL) of the mean concentration for chromium. In fact, we stated during conference calls that, because the vegetation functional group is partially represented by shallow-rooted bunchgrass, it would not be appropriate to pool the results over a 0-10 foot depth. Therefore, please separate the rationale relating to the continued use of the IWP, from the decision to pool the surface and subsurface chromium results. As currently written, the text is confusing because it appears to be using the rationale presented in our December 6, 2004 letter as a basis for pooling the data.	All discussion of pooled or combined data for IWP chromium data has been removed from the text. A footnote has been added to Section 5.4 referencing the December 4, 2004 letter.	
9	PP. 47, Sect. 6.1, Last Sentence		Please update this paragraph to reflect the final inspection that will be conducted this week by DEQ staff.	This paragraph has been updated to reflect the final inspection.	
10	Appendix B, Page B-3		This appendix is entitled, "Analyses of Verification Sampling and Removal of Contaminants of Concern," but consists only of references to the two Data Quality Assessment documents. If the analytical data are not going to be summarized in Appendix B, then it would be more appropriate to delete the Appendix, and just cite the DQA documents in the main text. There is no need to include a separate appendix that includes only two references to other documents.	This appendix has been deleted.	

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Comments resolved by:	Date:	Signature of reviewer accepting resolution of significant comments:	Date:
C. B. Potelunas/H. Guerrero (Portage)	05/03/2005		

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1	General		Add some discussion about how the situation with the Sanitary Sewage Lagoons still being in used delays their cleanup was resolved. Page 1, second paragraph, just notes that they were moved to OU 10-08. Some additional text explaining what this means and how the lagoons will be managed to insure no adverse impacts to human health or the environment needs to be added here or elsewhere in the report.	An updated discussion on the transfer of the SSL to OU 10-08 has been added to the text.	
2	General		Include a discussion/comparison of the volume of waste generated by phytoremediation versus that volume had only excavation been the remedial action. This data, in addition to the cost savings from the use of phytoremediation, can be used in a discussion of the success of phytoremediation	A discussion of the volume of waste generated during phytoremediation activities has been added as Section 3.1.6. A discussion of the volume of waste generated during excavation and disposal activities has been added as Section 3.2.3. A comparison between of the total volume of waste generated during remedial activities has been added to the text of Section 6.2.	
3	General		Add a short discussion that the QA/QC approach followed the one outlined in the QAPjP and RD/RA Work Plan. Also discuss how any deviation from the sampling plan, such as excavation to bedrock resulting in the inability to collect confirmation samples, was not significant enough to cause a rejection of the data.	The discussion of the QA/QC approach has been expanded in Section 4.2. Discussion concerning excavation to bedrock has been added to each applicable section by site (Sections 4.2.3 and 4.2.4).	
4	General		Add a section on observations and lessons learned. Discuss the cost savings of the action versus the estimate in the ROD and a synopsis of phytoremediation's ability to treat the majority of the site quicker than projected in the ROD. Also, note the impact of bedrock in regards to planting, excavation, and confirmation sampling. Discuss how tilling aiding in the remediation of the site.	A discussion on Lessons Learned has been added as Section 6.3. The section on costs (Section 6.2) has been expanded. Discussion regarding the impact of bedrock and tilling has also been added.	
5	General		Add a page with contact information. See Page A-11 in OSWER Directive 9320.2-09 A-D.	A contact information sheet containing information per OSWER Directive 9320.2-09 A-	

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				D has been added.	
6	General		The scenario that the Remediation Goals are based on should be stated. Is it future residential use or are all RG's based on eco-risk scenarios? This information can be either provided in the introduction or with each site specific discussion.	A discussion of the scenarios that the Remediation Goals were based on was added to Section 4.1.	
1	PP. 1, Sect. 1, 2nd Para.		Describe the mechanism used to transfer the SSLs to OU 10-08.	A description of the mechanisms used to transfer the SSLs to OU 10-08 has been added to Section 1.	
2	PP. 35, Sect. 4.2.5.1		This section discusses the confirmation sampling of Ditch A. It states that 6 surface soil samples were collected and 16 subsurface soil samples were collected. These numbers are not consistent with the sampling location map, Figure 23. Please review this section and figure and correct as necessary.	Typographical error, has been corrected to state 16 surface soil samples were collected.	
3	PP. 35, Sect. 4.2.5.2.		It is not clear in this section how many samples were collected. Is the number five surface soil samples and five subsurface composite and five post-remediation subsurface samples for a total of 15 samples or is it some other number? Since there is no figure associated with Ditch B it is even more difficult to establish the number of samples collected. EPA recommends this section be revised to make it clear how many samples were collected and that a figure showing the locations of the samples be included.	Information on Ditches A and B have been clarified. For additional clarity the discussion of Ditches A and B have been separated.	
4	PP. 47, Sect. 1.		EPA recommends that another section, Section 6.2, be added that discusses whether there were any health and safety issues associated with these cleanup actions. This section should also note the level of protectiveness required for the worker to perform the work.	A discussion on health and safety issues has been added as Section 6.4. The work was performed in level D PPE.	
5	PP. 49, Sect. 7		There is no mention of a specific Quality Assurance Project Plan in the references. Is a citation missing or is it included in one of the documents listed in this section? If the former please include it. Otherwise, in the response to comments, cite the document(s) that contains the QAPjP.	A reference to the ANL-W QAPjP has been added.	
6	PP. 14, Sect. 2.2.5, Milestone #1.		EPA recommends the last sentence be rewritten. A suggested rewrite is ". . . risk to human health. Mercury for Ditch A . . . for Ditch B presented an unacceptable risk to the ecological receptors."	Discussions on Ditch A and Ditch B have been separated for clarity.	
7	PP. 29, Sect. 3.2.4., 1st Sent.		Check whether the word "regarded" should actually be spelled "regraded".	Typographical error, has been corrected.	
8	PP. 29, Sect. 3.2.5, 2nd parg.		Was the revegetation completed in 2004 or will it really be completed in November 2005? In the last sentence of this section the word should be "either" not "neither".	Revegetation was completed in November 2004. Typographical errors have been corrected.	

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9	PP. 47, Sect. 1, 1st sentence.		Note the preferred designation of this region is Region 10, not Region X.	Designation has been changed, globally.	

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Technical Point of Contact: Brady J. Orchard, P.E.	Phone No.: 208-227-1381	Return Comments To:	E-Mail:	Comments Due By:	Reviewer's Name/Discipline: Department of Energy	Phone No.:

Comments resolved by:	Date:	Signature of reviewer accepting resolution of significant comments:	Date:
C. B. Potelunas (Portage)	06-15-05		

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Document ID: 05-002		Document Title: Remedial Action Report for Waste Area Remedial Action Report Waste Area Group 9, Operable Unit 9-04 at the Idaho National Laboratory		Revision ID: 1	June 2005
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1.	Page 1, Section 1.0 Paragraph 2		Please update language regarding transfer of SSLs to OU 10-08 to better reflect the agreement between the Agencies.	The paragraph has been changed to read: "The 1998 OU 9-04 ROD identified phytoremediation as the selected remedy for seven of the eight sites, pending the success of a bench-scale treatability study. An alternate remedy of excavation and disposal was selected if it became apparent that phytoremediation would not produce acceptable results in a reasonable timeframe. *Because the SSLs are still in operation, the Agencies have agreed to move release site ANL-04 from OU 9-04 to OU 10-08.* As the SSLs will continue to be flooded by wastewaters in the foreseeable future, it is unlikely that the ecological receptor identified in the OU 09-04 ROD for this site (merriams shrew) will interact with the contaminated soil present in the bottom of the SSLs. *Since OU 10-08 is currently scheduled to have the last ROD for INL, placement of the SSLs in this OU will ensure that it is addressed. The regulatory agreement with DOE's request to move the release site may be found in the CERCLA Administrative Record for OU 10-08, specifically Document Numbers 24903 and 24898 (Ceto 2005; Faulk 2005). Public notification of the change has been included in*	

Document ID: 05-002		Document Title: Remedial Action Report for Waste Area Remedial Action Report Waste Area Group 9, Operable Unit 9-04 at the Idaho National Laboratory		Revision ID: 1	June 2005
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				the INL Integrated CERCLA Five-Year Review Report, which will be published in September 2005. Until such time as the SSL are remediated, the MFC is required to conduct regular inspections to ensure the integrity of the bermed walls of the SSLs.	

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Technical Point of Contact: Brady J. Orchard, P.E.	Phone No.: 208-227-1381	Return Comments To:	E-Mail:	Comments Due By:	Reviewer's Name/Discipline: State of Idaho Department of Environmental Quality	Phone No.:

Comments resolved by:	Date:	Signature of reviewer accepting resolution of significant comments:	Date:
C. B. Potelunas (Portage)	6-15-05		

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1.	Page 27, Section 3.1.6 Paragraph 1, Last Sentence		Please delete this sentence. The fact that the baled kochia met the RWMC waste acceptance criteria implies that is was not hazardous waste. The second half of the sentence adds confusion because an onsite CERCLA disposal facility, such as the ICDF, does not require a permit.	The paragraph was rewritten to read: "...in the RWMC Subsurface Disposal Area (SDA). *The kochia sequestered only radioactive cesium-137 from the contaminated soil. Levels of this COC were measured at seven orders of magnitude less than the RWMC waste acceptance criteria (WAC) (5,360,000 pCi/g). The plant material did not contain any other hazardous compounds."*	
2.	Page 50, Section 5.4, Second Paragraph		This paragraph should be rewritten to better explain the basis for the RI risk management decision for the Industrial Waste Pond. The text also needs to explain why it is appropriate to re-visit the ecological exposure scenarios based on the revised mission for the IWP. This information was documented in the deleted text, and we recommend that some of the deleted text be restored. Also, the text should more clearly convey that the determination that no further remediation is warranted at this site is a consensus decision of the Agencies. As written, the text and footnote appear to attribute this determination only to M. English.	This paragraph was rewritten to read: "However, even with the removal of the data associated with the soils excavated from the northwest corner of the IWP, the 95% UCL for chromium still exceeds the RG for surface soils. *The ecological functional group for which trivalent chromium may pose an unacceptable risk is vegetation. In the RI/FS, the vegetation functional group was represented by sagebrush, which is deep rooted, and bunchgrass, which is shallow rooted. At the time the ROD was signed, it was assumed that the pond would cease receiving wastewater from operations and would be revegetated consistent with a desert steppe habitat. Therefore, both sagebrush and bunchgrass might be expected to reestablish in the former pond area. However, revised future plans call*	

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				for MFC to continue to use of the IWP for discharge of noncontaminated wastewaters. Since the IWP will continue to be flooded by the discharges, it is unlikely that either sagebrush or bunchgrass will reestablish over large portions of the pond in the foreseeable future. As the IWP will be used in the future to transport noncontaminated wastewater, it was determined that although the 95% UCL for chromium exceeds the RG for surface soils, the vegetative ecological risk receptors of bunchgrass and sagebrush are unlikely to reestablish in the IWP. Therefore, it was determined *through a consensus agreement of the OU 9-04 WAG managers* that further remediation of the IWP is not warranted."	

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